

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|   |   |   |   |
|---|---|---|---|
| Applicant's or agent's file reference<br>MH/FI990967  | <b>FOR FURTHER ACTION</b>   |   | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |
| International application No.<br>PCT/FI00/00320   | International filing date ( <i>day/month/year</i> )<br>14.04.2000 | Priority date ( <i>day/month/year</i> )<br>28.04.1999 |   |
| International Patent Classification (IPC) or national classification and IPC <sub>7</sub><br>D 21 F 1/02, D 21 F 1/08 |   |   |   |
| Applicant<br>METSO PAPER INC. et al   |   |   |   |

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| <p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>3</u> sheets.</p> <p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the report</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input type="checkbox"/> Certain defects in the international application</li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul> |
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| Date of submission of the demand<br><br>04.10.2000   | Date of completion of this report<br><br>24.07.2001                      |
| Name and mailing address of the IPEA/SE<br>Patent- och registreringsverket<br>Box 5055<br>S-102 42 STOCKHOLM<br>Facsimile No. 08-667 72 88 | Authorized officer<br><br>Wiva Asplund/ELY<br>Telephone No. 08-782 25 00 |

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00320

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

- ☐ the international application as originally filed
- ☒ the description:  
pages 1-7 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the claims:  
pages \_\_\_\_\_, as originally filed  
pages 1-7 \_\_\_\_\_, as amended (together with any statement) under article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the drawings:  
pages 1-2 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.  
These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheet/fig \_\_\_\_\_

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00320

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

|                               |        |            |     |
|-------------------------------|--------|------------|-----|
| Novelty (N)                   | Claims | <u>1-7</u> | YES |
|                               | Claims |            | NO  |
| Inventive step (IS)           | Claims | <u>1-7</u> | YES |
|                               | Claims |            | NO  |
| Industrial applicability (IA) | Claims | <u>1-7</u> | YES |
|                               | Claims |            | NO  |

### 2. Citations and explanations (Rule 70.7)

Documents cited in the International Search Report:

D1) EP 0824157 A2

D2) US 4897158 A

The invention according to the amended claims of September 14, 2000 relates to a method and a headbox for passing dilution water into connection with a stock flow in a paper or board machine.

Document D1 discloses a method to distribute a fibre suspension in a headbox of a paper machine.

Document D2 discloses a headbox for a papermaking machine with an adjustable distribution of the fibre stock suspension over the web width.

Both the cited documents are now considered to show the closest background art. The reason for this revaluation is that none of the documents disclose a method for passing dilution water to a stock flow in a headbox in at least two stages using in the first dilution stage, valves fitted with a larger mutual spacing at different points of width across the headbox, and using in the second dilution stage, valves fitted with a denser spacing than the valves of the first dilution stage. A coarse control of the basis weight profile of the stock is carried out in the first dilution stage, and a fine control in the second dilution stage across the width of the machine.

Therefore, the claimed invention according to claims 1-7 is novel, is considered to involve an inventive step and be industrially applicable.

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INTERNATIONAL SEARCH REPORTInternational application No.  
PCT/FI 00/00320

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21F 1/02, D21F 1/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|-----------|---|-----------------------|
| X         | EP 0824157 A2 (VOITH SULZER PAPIERMASCHINEN GMBH),<br>18 February 1998 (18.02.98), column 8,<br>line 22 - column 11, line 21, figures 1-4<br><br>-- | 1-9                   |
| X         | US 4897158 A (ELMER WEISSHUHN ET AL),<br>30 January 1990 (30.01.90), column 12,<br>line 10 - column 13, line 58, figure 6<br><br>--<br>-----        | 1-9                   |

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

- \* Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

24 August 2000

Date of mailing of the international search report

28-08-2000

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

08/05/00

International application No.  
PCT/FI 00/00320

| Patent document<br>cited in search report |         |    | Publication<br>date | Patent family<br>member(s) |          |       | Publication<br>date |
|---|---------|----|---------------------|----------------------------|----------|-------|---------------------|
| EP  | 0824157 | A2 | 18/02/98            | DE                         | 19632672 | A     | 19/02/98            |
|   |         |    |                     | DE                         | 19632673 | A     | 19/02/98            |
| <hr/>                                     |         |    |                     |                            |          |       |                     |
| US  | 4897158 | A  | 30/01/90            | AT                         | 47438    | T     | 15/11/89            |
|   |         |    |                     | DE                         | 3514554  | A,C,R | 27/03/86            |
|   |         |    |                     | DE                         | 3573813  | D     | 00/00/00            |
|   |         |    |                     | EP                         | 0195807  | A,B   | 01/10/86            |
|   |         |    |                     | SE                         | 0195807  | T3    |                     |
|   |         |    |                     | FI                         | 90359    | B     | 15/10/93            |
|   |         |    |                     | FI                         | 861944   | A     | 09/05/86            |
|   |         |    |                     | US                         | 4888094  | A     | 19/12/89            |
|   |         |    |                     | US                         | 4898643  | A     | 06/02/90            |
|   |         |    |                     | WO                         | 8601844  | A     | 27/03/86            |
|   |         |    |                     | DE                         | 3439051  | A     | 27/03/86            |
| <hr/>                                     |         |    |                     |                            |          |       |                     |

## PATENT COOPERATION TREATY

27 -11- 2000

PCT

NOTIFICATION CONCERNING  
AMENDMENTS OF THE CLAIMS(PCT Rule 62 and  
Administrative Instructions, Section 417)

From the INTERNATIONAL BUREAU

To:

Swedish Patent Office  
P.O. Box 5055  
S-102 42 Stockholm  
SUÈDE

in its capacity as International Preliminary Examining Authority

Date of mailing (day/month/year)

21 November 2000 (21.11.00)

International application No.

PCT/FI00/00320

International filing date (day/month/year)

14 April 2000 (14.04.00)

Applicant

VALMET CORPORATION et al

The International Bureau hereby transmits a copy of the amendments to the claims under Article 19 together with any accompanying statement (Rule 62).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

Charlotte ENGER

Telephone No. (41-22) 338.83.38

Claims

1. A method for passing dilution water into connection with a stock flow passed from a stock inlet header of a headbox in a paper or board machine, **characterized** in that, in  
5 the method, dilution is carried out in at least two stages using in the first dilution stage (I) valves ( $V_1, V_2, V_3, \dots$ ) fitted with a larger mutual spacing at different points of width across the headbox and passing the dilution water through said valves to desired points of width of the headbox according to the requirement of control of the basis weight of paper or board, and that, in the method, in the second dilution stage (II), dilution water  
10 is passed into connection with the stock flow coming from the first dilution stage (I), said dilution water being controlled by means of valves ( $V'_1, V'_2, \dots$ ), which valves ( $V'_1, V'_2, \dots$ ) have been fitted with a denser spacing than the valves ( $V_1, V_2, V_3, \dots$ ) of the first dilution stage (I), and that coarse control of the basis weight profile of the stock ( $M_1$ ) is carried out in the first dilution stage (I) and fine control of the basis weight profile of the stock ( $M_1$ ) is carried out in the second dilution stage (II) across the width of the machine.  
15
2. A method according to claim 1, **characterized** in that in the second stage (II) of dilution, as dilution water is used water the solids, filler or fibre content of which is  
20 substantially lower in percentage terms than that of the dilution water of the first stage (I) of dilution.
3. A method according to claim 1 or 2, **characterized** in that the dilution water used in the second dilution stage (II) is raw water or clarified white water.  
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4. A method according to any one of the preceding claims, **characterized** in that the dilution water of the first stage (I) is white water.
5. A headbox (10) of a paper or board machine which comprises a stock inlet header  
30 ( $J_1$ ) and after that a tube bank (11) and after the tube bank an intermediate chamber (12) and after the intermediate chamber a turbulence generator (13) and after the turbulence

- generator a slice cone (14) from which stock is passed further onto a forming wire ( $H_1$ ), characterized in that the apparatus comprises valves ( $V_1, V_2, V_3, \dots$ ) of a first dilution stage (I), through which valves dilution water is passed into connection with the stock ( $M_1$ ) passed from the inlet header ( $J_1$ ) to desired points across the width of the headbox
- 5 so as to control the basis weight of the web in the first stage (I), and that the headbox comprises valves ( $V_1', V_2', V_3', \dots$ ) of a second dilution stage (II), through which valves ( $V_1', V_2', \dots$ ) the dilution water of the second stage is passed into connection with the stock ( $M_1$ ) coming from the first dilution stage (I), and that the valves ( $V_1, V_2, V_3, \dots$ ) of the first dilution stage (I) are spaced a longer distance from one another than the valves
- 10 ( $V_1', V_2', V_3', \dots$ ) of the second dilution stage (II), in which connection coarse control of the basis weight of the web is carried out by means of the valves ( $V_1, V_2, \dots$ ) of the first dilution stage (I) and fine control of the basis weight of the web is carried out by means of the valves ( $V_1', V_2', \dots$ ) of the second dilution stage (II).
- 15 6. A headbox of a paper or board machine according to claim 5, characterized in that the dilution water of the first dilution stage (I) is passed into connection with the stock ( $M_1$ ) passed from the stock inlet header ( $J_1$ ) in connection with the tube bank (11), and that the dilution water of the second dilution stage (II) is passed into connection with the stock ( $M_1$ ) coming from the first dilution stage (I) in connection with the turbulence
- 20 generator (13).
7. A headbox according to claim 5 or 6, characterized in that the apparatus comprises an inlet header ( $J_3$ ) for the dilution water of the second dilution stage (II), said inlet header comprising raw water as dilution water.

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# TENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|   |   |   |
|---|---|---|
| Applicant's or agent's file reference<br>MH/FI990967  | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |   |
| International application No.<br>PCT/FI00/00320   | International filing date ( <i>day/month/year</i> )<br>14.04.2000   | Priority date ( <i>day/month/year</i> )<br>28.04.1999 |
| International Patent Classification (IPC) or national classification and IPC <sub>7</sub><br>D 21 F 1/02, D 21 F 1/08 |   |   |
| Applicant<br>METSO PAPER INC. et al   |   |   |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

|   |  |
|---|--|
| Date of submission of the demand<br><br>04.10.2000  | Date of completion of this report<br><br>24.07.2001                      |
| Name and mailing address of the IPEA/SE<br>Patent- och registreringsverket      Telex<br>Box 5055      17978<br>S-102 42 STOCKHOLM      PATOREG-S<br>Facsimile No. 08-667 72 88 | Authorized officer<br><br>Wiva Asplund/ELY<br>Telephone No. 08-782 25 00 |

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☐ the international application as originally filed
- ☒ the description:  
pages 1-7 , as originally filed  
pages \_\_\_\_\_ , filed with the demand  
pages \_\_\_\_\_ , filed with the letter of \_\_\_\_\_
- ☒ the claims:  
pages \_\_\_\_\_ , as originally filed  
pages 1-7 , as amended (together with any statement) under article 19  
pages \_\_\_\_\_ , filed with the demand  
pages \_\_\_\_\_ , filed with the letter of \_\_\_\_\_
- ☒ the drawings:  
pages 1-2 , as originally filed  
pages \_\_\_\_\_ , filed with the demand  
pages \_\_\_\_\_ , filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_ , as originally filed  
pages \_\_\_\_\_ , filed with the demand  
pages \_\_\_\_\_ , filed with the letter of \_\_\_\_\_

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ \*furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheet/fig \_\_\_\_\_

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

|                               |        |            |     |
|-------------------------------|--------|------------|-----|
| Novelty (N)                   | Claims | <u>1-7</u> | YES |
|                               | Claims |            | NO  |
| Inventive step (IS)           | Claims | <u>1-7</u> | YES |
|                               | Claims |            | NO  |
| Industrial applicability (IA) | Claims | <u>1-7</u> | YES |
|                               | Claims |            | NO  |

**2. Citations and explanations (Rule 70.7)**

Documents cited in the International Search Report:

D1) EP 0824157 A2

D2) US 4897158 A

The invention according to the amended claims of September 14, 2000 relates to a method and a headbox for passing dilution water into connection with a stock flow in a paper or board machine.

Document D1 discloses a method to distribute a fibre suspension in a headbox of a paper machine.

Document D2 discloses a headbox for a papermaking machine with an adjustable distribution of the fibre stock suspension over the web width.

Both the cited documents are now considered to show the closest background art. The reason for this revaluation is that none of the documents disclose a method for passing dilution water to a stock flow in a headbox in at least two stages using in the first dilution stage, valves fitted with a larger mutual spacing at different points of width across the headbox, and using in the second dilution stage, valves fitted with a denser spacing than the valves of the first dilution stage. A coarse control of the basis weight profile of the stock is carried out in the first dilution stage, and a fine control in the second dilution stage across the width of the machine.

Therefore, the claimed invention according to claims 1-7 is novel, is considered to involve an inventive step and be industrially applicable.

## PATENT COOPERATION TREATY

27 - 11 - 2000

PCT

NOTIFICATION CONCERNING  
AMENDMENTS OF THE CLAIMS(PCT Rule 62 and  
Administrative Instructions, Section 417)

From the INTERNATIONAL BUREAU

To:

Swedish Patent Office  
P.O. Box 5055  
S-102 42 Stockholm  
SUÈDE

Date of mailing (day/month/year)

21 November 2000 (21.11.00)

in its capacity as International Preliminary Examining Authority

International application No.

PCT/FI00/00320

International filing date (day/month/year)

14 April 2000 (14.04.00)

Applicant

VALMET CORPORATION et al

The International Bureau hereby transmits a copy of the amendments to the claims under Article 19 together with any accompanying statement (Rule 62).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

Charlotte ENGER

Telephone No. (41-22) 338.83.38

Claims

1. A method for passing dilution water into connection with a stock flow passed from a stock inlet header of a headbox in a paper or board machine, **characterized** in that, in the method, dilution is carried out in at least two stages using in the first dilution stage (I) valves ( $V_1, V_2, V_3, \dots$ ) fitted with a larger mutual spacing at different points of width across the headbox and passing the dilution water through said valves to desired points of width of the headbox according to the requirement of control of the basis weight of paper or board, and that, in the method, in the second dilution stage (II), dilution water is passed into connection with the stock flow coming from the first dilution stage (I), said dilution water being controlled by means of valves ( $V_1', V_2', \dots$ ), which valves ( $V_1', V_2', \dots$ ) have been fitted with a denser spacing than the valves ( $V_1, V_2, V_3, \dots$ ) of the first dilution stage (I), and that coarse control of the basis weight profile of the stock ( $M_1$ ) is carried out in the first dilution stage (I) and fine control of the basis weight profile of the stock ( $M_1$ ) is carried out in the second dilution stage (II) across the width of the machine.
2. A method according to claim 1, **characterized** in that in the second stage (II) of dilution, as dilution water is used water the solids, filler or fibre content of which is substantially lower in percentage terms than that of the dilution water of the first stage (I) of dilution.
3. A method according to claim 1 or 2, **characterized** in that the dilution water used in the second dilution stage (II) is raw water or clarified white water.
4. A method according to any one of the preceding claims, **characterized** in that the dilution water of the first stage (I) is white water.
5. A headbox (10) of a paper or board machine which comprises a stock inlet header ( $J_1$ ) and after that a tube bank (11) and after the tube bank an intermediate chamber (12) and after the intermediate chamber a turbulence generator (13) and after the turbulence

- generator a slice cone (14) from which stock is passed further onto a forming wire ( $H_1$ ), **characterized** in that the apparatus comprises valves ( $V_1, V_2, V_3, \dots$ ) of a first dilution stage (I), through which valves dilution water is passed into connection with the stock ( $M_1$ ) passed from the inlet header ( $J_1$ ) to desired points across the width of the headbox so as to control the basis weight of the web in the first stage (I), and that the headbox comprises valves ( $V_1', V_2', V_3', \dots$ ) of a second dilution stage (II), through which valves ( $V_1', V_2', \dots$ ) the dilution water of the second stage is passed into connection with the stock ( $M_1$ ) coming from the first dilution stage (I), and that the valves ( $V_1, V_2, V_3, \dots$ ) of the first dilution stage (I) are spaced a longer distance from one another than the valves ( $V_1', V_2', V_3', \dots$ ) of the second dilution stage (II), in which connection coarse control of the basis weight of the web is carried out by means of the valves ( $V_1, V_2, \dots$ ) of the first dilution stage (I) and fine control of the basis weight of the web is carried out by means of the valves ( $V_1', V_2', \dots$ ) of the second dilution stage (II).
6. A headbox of a paper or board machine according to claim 5, **characterized** in that the dilution water of the first dilution stage (I) is passed into connection with the stock ( $M_1$ ) passed from the stock inlet header ( $J_1$ ) in connection with the tube bank (11), and that the dilution water of the second dilution stage (II) is passed into connection with the stock ( $M_1$ ) coming from the first dilution stage (I) in connection with the turbulence generator (13).
7. A headbox according to claim 5 or 6, **characterized** in that the apparatus comprises an inlet header ( $J_3$ ) for the dilution water of the second dilution stage (II), said inlet header comprising raw water as dilution water.

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 01 AUG 2001

WIPO

PCT

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| Applicant's or agent's file reference<br>MH/FI990967  | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |  |
| International application No.<br>PCT/FI00/00320   | International filing date (day/month/year)<br>14.04.2000  | Priority date (day/month/year)<br>28.04.1999 |
| International Patent Classification (IPC) or national classification and IPC <sub>7</sub><br>D 21 F 1/02, D 21 F 1/08 |   |  |
| Applicant<br>METSO PAPER INC. et al   |   |  |

|   |
|---|
| <p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>3</u> <u>2</u> sheets.</p>  |
| <p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p> |

|  |  |
|--|--|
| Date of submission of the demand<br><br>04.10.2000   | Date of completion of this report<br><br>24.07.2001                      |
| Name and mailing address of the IPEA/SE<br>Patent- och registreringsverket<br>Box 5055<br>S-102 42 STOCKHOLM<br>Facsimile No. 08-667 72 88 | Authorized officer<br><br>Wiva Asplund/ELY<br>Telephone No. 08-782 25 00 |

Form PCT/IPEA/409 (cover sheet) (January 1998)

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00320

## I. Basis of the report

1. With regard to the **elements** of the international application:\*

- ☐ the international application as originally filed
- ☒ the description:  
pages 1-7 , as originally filed  
pages \_\_\_\_\_ , filed with the demand  
pages \_\_\_\_\_ , filed with the letter of \_\_\_\_\_
- ☒ the claims:  
pages \_\_\_\_\_ , as originally filed  
pages 1-7 , as amended (together with any statement) under article 19  
pages \_\_\_\_\_ , filed with the demand  
pages \_\_\_\_\_ , filed with the letter of \_\_\_\_\_
- ☒ the drawings:  
pages 1-2 , as originally filed  
pages \_\_\_\_\_ , filed with the demand  
pages \_\_\_\_\_ , filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_ , as originally filed  
pages \_\_\_\_\_ , filed with the demand  
pages \_\_\_\_\_ , filed with the letter of \_\_\_\_\_

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheet/fig \_\_\_\_\_

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.



## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00320

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

|                               |        |            |     |
|-------------------------------|--------|------------|-----|
| Novelty (N)                   | Claims | <u>1-7</u> | YES |
|                               | Claims |            | NO  |
| Inventive step (IS)           | Claims | <u>1-7</u> | YES |
|                               | Claims |            | NO  |
| Industrial applicability (IA) | Claims | <u>1-7</u> | YES |
|                               | Claims |            | NO  |

**2. Citations and explanations (Rule 70.7)**

Documents cited in the International Search Report:

D1) EP 0824157 A2

D2) US 4897158 A

The invention according to the amended claims of September 14, 2000 relates to a method and a headbox for passing dilution water into connection with a stock flow in a paper or board machine.

Document D1 discloses a method to distribute a fibre suspension in a headbox of a paper machine.

Document D2 discloses a headbox for a papermaking machine with an adjustable distribution of the fibre stock suspension over the web width.

Both the cited documents are now considered to show the closest background art. The reason for this revaluation is that none of the documents disclose a method for passing dilution water to a stock flow in a headbox in at least two stages using in the first dilution stage, valves fitted with a larger mutual spacing at different points of width across the headbox, and using in the second dilution stage, valves fitted with a denser spacing than the valves of the first dilution stage. A coarse control of the basis weight profile of the stock is carried out in the first dilution stage, and a fine control in the second dilution stage across the width of the machine.

Therefore, the claimed invention according to claims 1-7 is novel, is considered to involve an inventive step and be industrially applicable.

## Claims

1. A method for passing dilution water into connection with a stock flow passed from a stock inlet header of a headbox in a paper or board machine, **characterized** in that, in the method, dilution is carried out in at least two stages using in the first dilution stage (I) valves ( $V_1, V_2, V_3, \dots$ ) fitted with a larger mutual spacing at different points of width across the headbox and passing the dilution water through said valves to desired points of width of the headbox according to the requirement of control of the basis weight of paper or board, and that, in the method, in the second dilution stage (II), dilution water is passed into connection with the stock flow coming from the first dilution stage (I), said dilution water being controlled by means of valves ( $V_1', V_2', \dots$ ), which valves ( $V_1', V_2', \dots$ ) have been fitted with a denser spacing than the valves ( $V_1, V_2, V_3, \dots$ ) of the first dilution stage (I), and that coarse control of the basis weight profile of the stock ( $M_1$ ) is carried out in the first dilution stage (I) and fine control of the basis weight profile of the stock ( $M_1$ ) is carried out in the second dilution stage (II) across the width of the machine.
2. A method according to claim 1, **characterized** in that in the second stage (II) of dilution, as dilution water is used water the solids, filler or fibre content of which is substantially lower in percentage terms than that of the dilution water of the first stage (I) of dilution.
3. A method according to claim 1 or 2, **characterized** in that the dilution water used in the second dilution stage (II) is raw water or clarified white water.
4. A method according to any one of the preceding claims, **characterized** in that the dilution water of the first stage (I) is white water.
5. A headbox (10) of a paper or board machine which comprises a stock inlet header ( $J_1$ ) and after that a tube bank (11) and after the tube bank an intermediate chamber (12) and after the intermediate chamber a turbulence generator (13) and after the turbulence

- generator a slice cone (14) from which stock is passed further onto a forming wire ( $H_1$ ), **characterized** in that the apparatus comprises valves ( $V_1, V_2, V_3, \dots$ ) of a first dilution stage (I), through which valves dilution water is passed into connection with the stock ( $M_1$ ) passed from the inlet header ( $J_1$ ) to desired points across the width of the headbox
- 5 so as to control the basis weight of the web in the first stage (I), and that the headbox comprises valves ( $V_1', V_2', V_3', \dots$ ) of a second dilution stage (II), through which valves ( $V_1', V_2', \dots$ ) the dilution water of the second stage is passed into connection with the stock ( $M_1$ ) coming from the first dilution stage (I), and that the valves ( $V_1, V_2, V_3, \dots$ ) of the first dilution stage (I) are spaced a longer distance from one another than the valves
- 10 ( $V_1', V_2', V_3', \dots$ ) of the second dilution stage (II), in which connection coarse control of the basis weight of the web is carried out by means of the valves ( $V_1, V_2, \dots$ ) of the first dilution stage (I) and fine control of the basis weight of the web is carried out by means of the valves ( $V_1', V_2', \dots$ ) of the second dilution stage (II).
- 15 6. A headbox of a paper or board machine according to claim 5, **characterized** in that the dilution water of the first dilution stage (I) is passed into connection with the stock ( $M_1$ ) passed from the stock inlet header ( $J_1$ ) in connection with the tube bank (11), and that the dilution water of the second dilution stage (II) is passed into connection with the stock ( $M_1$ ) coming from the first dilution stage (I) in connection with the turbulence
- 20 generator (13).
7. A headbox according to claim 5 or 6, **characterized** in that the apparatus comprises an inlet header ( $J_3$ ) for the dilution water of the second dilution stage (II), said inlet header comprising raw water as dilution water.

25

# RECORD COPY

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## PCT REQUEST

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MH/FI990967

|         |   |  |
|---------|---|--|
| 0       | For receiving Office use only   |  |
| 0-1     | International Application No.   | PCT/FI 0 0 / 0 0 3 2 0   |
| 0-2     | International Filing Date   | 14 APR 2000 (14 -04- 2000)   |
| 0-3     | Name of receiving Office and "PCT International Application"  | The Finnish Patent Office<br>PCT International Application                                       |
| 0-4     | Form - PCT/RO/101 PCT Request   |  |
| 0-4-1   | Prepared using  | PCT-EASY Version 2.90<br>(updated 08.03.2000)  |
| 0-5     | Petition<br>The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty |  |
| 0-6     | Receiving Office (specified by the applicant)   | National Board of Patents and Registration (Finland) (RO/FI)                                     |
| 0-7     | Applicant's or agent's file reference   | MH/FI990967  |
| I       | Title of invention  | METHOD AND EQUIPMENT FOR MIXING OF DILUTION LIQUID INTO A STOCK FLOW IN A PAPER OR BOARD MACHINE |
| II      | Applicant   |  |
| II-1    | This person is:   | applicant only   |
| II-2    | Applicant for   | all designated States except US  |
| II-4    | Name  | VALMET CORPORATION   |
| II-5    | Address:  | Fabianinkatu 9 A<br>FIN-00130 HELSINKI<br>Finland  |
| II-6    | State of nationality  | FI   |
| II-7    | State of residence  | FI   |
| III-1   | Applicant and/or inventor   |  |
| III-1-1 | This person is:   | applicant and inventor   |
| III-1-2 | Applicant for   | US only  |
| III-1-4 | Name (LAST, First)  | LUMIALA, Juhana  |
| III-1-5 | Address:  | Hukkaperä 2 B 6<br>FIN-40400 JYVÄSKYLÄ<br>Finland  |
| III-1-6 | State of nationality  | FI   |
| III-1-7 | State of residence  | FI   |

## PCT REQUEST

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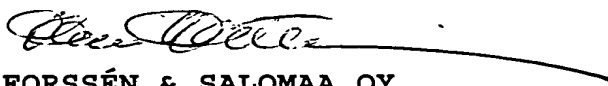
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|          |  |  |
|----------|--|--|
| IV-1     | <b>Agent or common representative; or address for correspondence</b><br>The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: | <b>agent</b>   |
| IV-1-1   | Name   | <b>FORSSÉN &amp; SALOMAA OY</b>  |
| IV-1-2   | Address:   | <b>Yrjönkatu 30<br/>FIN-00100 HELSINKI<br/>Finland</b>   |
| IV-1-3   | Telephone No.  | <b>+358 9 615 3500</b>   |
| IV-1-4   | Facsimile No.  | <b>+358 9 615 35111</b>  |
| IV-1-5   | e-mail   | <b>forsapat@fspat.fi</b>   |
| <b>V</b> | <b>Designation of States</b>   |  |
| V-1      | Regional Patent<br>(other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)  | <b>AP: GH GM KE LS MW SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT</b><br><b>EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT</b><br><b>EP: AT BE CH&amp;LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT</b><br><b>OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT</b> |
| V-2      | National Patent<br>(other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)  | <b>AE AG AL AM AT (patent and utility model) AU AZ BA BB BG BR BY CA CH&amp;LI CN CR CU CZ (patent and utility model) DE (patent and utility model) DK (patent and utility model) DM DZ EE (patent and utility model) ES FI (patent and utility model) GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK (patent and utility model) SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW</b>  |

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|                |   |  |
|----------------|---|--|
| <b>V-5</b>     | <b>Precautionary Designation Statement</b><br>In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. |  |
| <b>V-6</b>     | <b>Exclusion(s) from precautionary designations</b>   | <b>NONE</b>  |
| <b>VI-1</b>    | <b>Priority claim of earlier national application</b>   |  |
| VI-1-1         | Filing date   | <b>28 April 1999 (28.04.1999)</b>  |
| VI-1-2         | Number  | <b>990967</b>  |
| VI-1-3         | Country   | <b>FI</b>  |
| <b>VI-2</b>    | <b>Priority document request</b><br>The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):   | <b>VI-1</b>  |
| <b>VII-1</b>   | <b>International Searching Authority Chosen</b>   | <b>Swedish Patent Office (ISA/SE)</b>  |
| <b>VIII</b>    | <b>Check list</b>   | number of sheets      electronic file(s) attached                                    |
| VIII-1         | Request   | <b>4</b> -   |
| VIII-2         | Description   | <b>7</b> -   |
| VIII-3         | Claims  | <b>2</b> -   |
| VIII-4         | Abstract  | <b>1</b> <b>990967.txt</b>   |
| VIII-5         | Drawings  | <b>2</b> -   |
| VIII-7         | TOTAL   | <b>16</b>  |
|                | <b>Accompanying items</b>   | paper document(s) attached      electronic file(s) attached                          |
| VIII-8         | Fee calculation sheet   | ✓      -   |
| VIII-9         | Separate signed power of attorney   | ✓      -   |
| VIII-10        | Copy of general power of attorney   | ✓      -   |
| VIII-16        | PCT-EASY diskette   | - <b>diskette</b>  |
| VIII-17        | Other (specified):  | <b>Official Action</b> -   |
| <b>VIII-18</b> | <b>Figure of the drawings which should accompany the abstract</b>   | <b>2</b>   |
| <b>VIII-19</b> | <b>Language of filing of the international application</b>  | <b>Finnish</b>   |
| <b>IX-1</b>    | <b>Signature of applicant or agent</b>  |  |
| IX-1-1         | Name  | <b>FORSSÉN &amp; SALOMAA OY</b>  |
| IX-1-2         | Name of signatory   | <b>Mauri Herttuainen</b>   |

## FOR RECEIVING OFFICE USE ONLY

|             |  |                    |                     |
|-------------|--|--------------------|---------------------|
| <b>10-1</b> | <b>Date of actual receipt of the purported international application</b> | <b>14 APR 2000</b> | <b>(14-04-2000)</b> |
|-------------|--|--------------------|---------------------|

**PCT REQUEST**

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**PCT/FI 00 / 00320**Original (for **SUBMISSION**) - printed on 14.04.2000 11:24:18 AM

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|        |   |        |
|--------|---|--------|
| 10-2   | Drawings:   |        |
| 10-2-1 | Received  |        |
| 10-2-2 | Not received  |        |
| 10-3   | Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application |        |
| 10-4   | Date of timely receipt of the required corrections under PCT Article 11(2)  |        |
| 10-5   | International Searching Authority   | ISA/SE |
| 10-6   | Transmittal of search copy delayed until search fee is paid   |        |

**FOR INTERNATIONAL BUREAU USE ONLY**

|      |  |             |              |
|------|--|-------------|--------------|
| 11-1 | Date of receipt of the record copy by the International Bureau | 09 MAY 2000 | ( 09.05.00 ) |
|------|--|-------------|--------------|

FIG. 1A

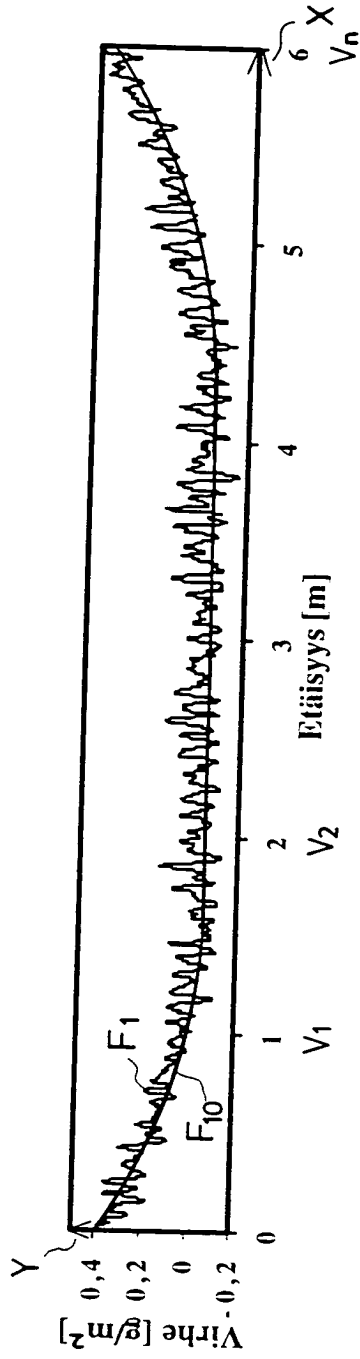


FIG. 1B

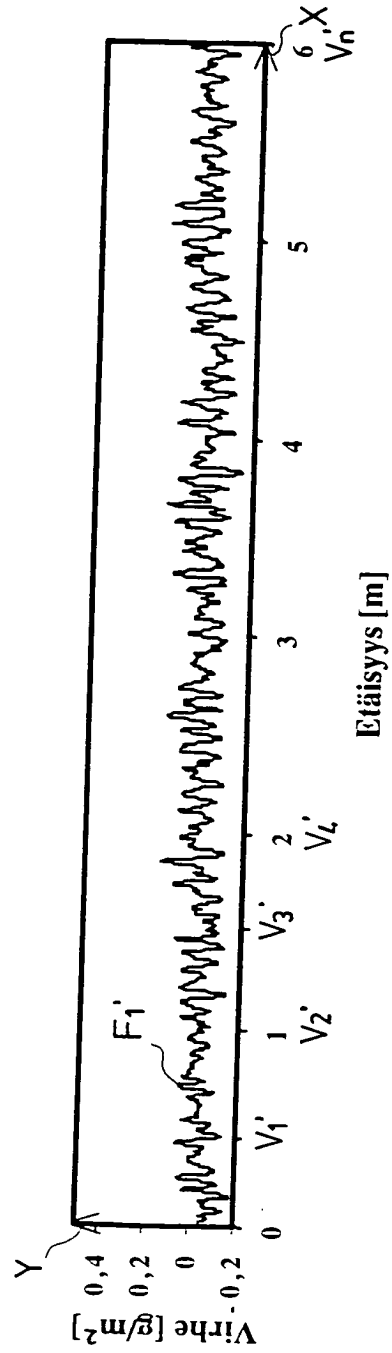
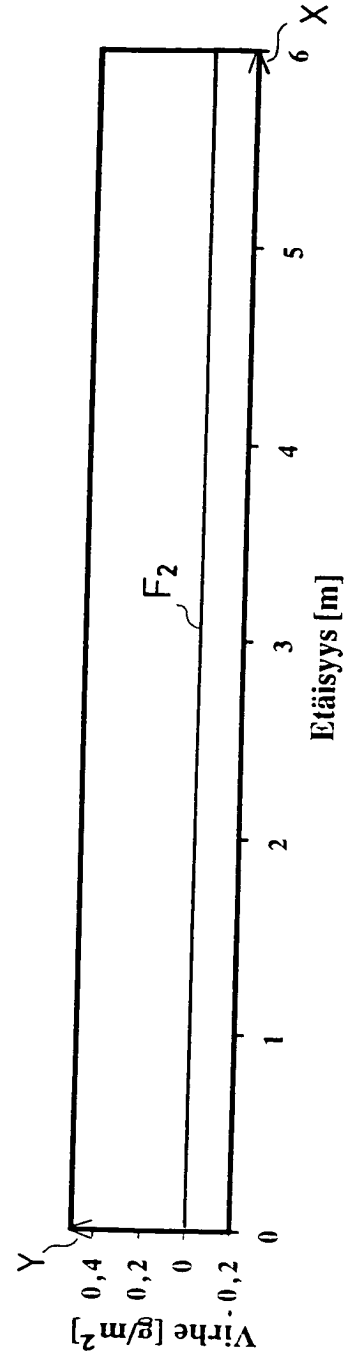
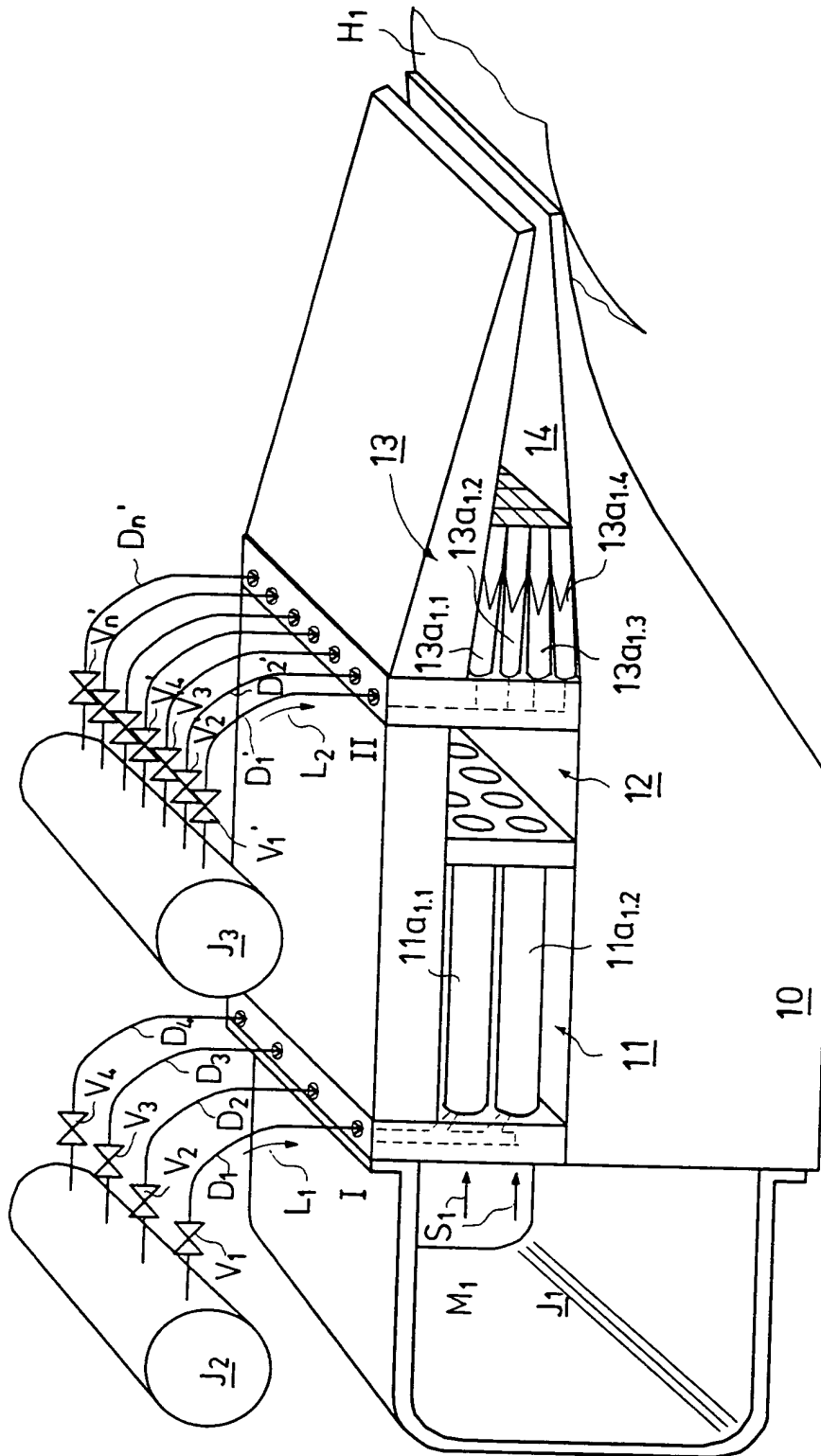


FIG. 1C







Menetelmä ja laitteisto laimennusnesteen sekoittamiseksi  
massavirtaukseen paperikoneessa tai kartonkikoneessa

5

Keksinnön kohteena on menetelmä ja laitteisto laimennusnesteen sekoittamiseksi massavirtaukseen paperikoneessa tai kartonkikoneessa.

10 Tekniikan tason osalta viittaamme julkaisuun DE-19723861 ja FI 901593.

On osoittautunut, että mittauslaitteiden kehittymisen myötä markkinoilla neliömassaprofiilin säätötarkkuusvaatimukset kasvavat aina vain enemmän. Tavanomaisen ns. laimennusperälaatikon laimennusjakoväli on tällä hetkellä noin 32–75 mm, eikä sen  
15 pienentäminen enää ole mahdollista, jos laimennusvetenä käytetään kuituja sisältävää viiravettä, koska viiravedellä auki pysyvät laimennuksen syöttökanavat eivät mahdu tiheällä jaolla olevien pillirivien väliin.

20 Ratkaisuksi esitetään tarvittaessa laimennuksen muuttamista kaksivaiheiseksi siten, että karkeasäätö tehdään viiravedellä ja hienosäätö raakavedellä.

Kasvava säätötarkkuusvaatimus edellyttää yhä tiheämpää laimennusjakoväliä ja sitä kautta yhä ahtaampia laimennussyöttökanavia. Mikäli laimennusvetenä käytetään viiravettä, tukkeentuvat ahtaat laimennuskanavat helposti. Raakavedellä ei tukkeentumiso  
25 ngelmia esiinny, mutta sen "täysimääräinen käyttö" ei ole taloudellisista ja ympäristösyistä järkevää.

Kaksivaiheisen laimennuksen idea on korjata suuret neliömassaprofiilivirheet suurella viiravesimäärällä ja pienet profiilivirheet pienellä raakavesimäärällä. Näin saavutetaan  
30 paperitehtaalla hyvä raakavesitalous.

Toinen kaksivaiheisuuden etu on neliömassaprofiilin hyvä säätömahdollisuus. Voidaan käyttää koko venttiilin säätöalue hyväksi ja voidaan valita molempiin säätöihin optimikokoiset säätöventtiilit.

- 5 Karkeasäätö tehdään jakotukin jälkeiseen pillistöön kuten konventionaalisessa perälaatikossa. Säädön jakoväli ensimmäisessä laimennusvaiheessa voidaan kasvattaa esim. 120 mm:iin siten, että yksi laimennuselin syöttää kahta pilliriviä. Karkeasäätö korjaa profiilin karkeat muotovirheet, kuten esim. radan kutistumisesta aiheutuvat profiilivirheet. Karkeasäädön jälkeen profiiliin jäljelle jäävät pienet virheet korjataan toisen vaiheen hienosäätölaimennuksella.
- 10

- Hienosäätö tehdään turbulenssigenaattorilaimennuksena laimentamalla joitain, tai jokaista, turbulenssigenaattorin pilliä. Jäljellä olevien pienten virheiden korjaamiseen tarvitaan hyvin pieni laimennus, joten hienosäädön laimennusvetenä voidaan käyttää taloudellisesti raakavettä tai kuitujen talteenotosta saatavaa kirkastettua viiravettä. Koska esim. raakavesi ei sisällä likaavia tai tukkivia partikkeleita, voidaan laimennuskana-
- 15 vat tehdä hyvin ahtaisiin tiloihin. Lisäksi säätöventtiilit, sekä venttiilejä käyttävät toimilaitteet, voivat olla tavallisia markkinoilta löytyviä standardilaitteita, jotka ovat huomattavasti edullisempia konventionaaliin laimennusventtiileihin ja toimilaitteisiin verrattuna.
- 20

- Paikallinen minimilaimennus raakavedellä voi olla lähes 0 % ja maksimipaikallislaimennuksen ei tarvitse olla korkea, koska raakaveden sakeus on 0 % ja jäljellä oleva korjattava virhe on pieni. Näin ollen kalliimpaa raakavettä kulutetaan hyvin pieni määrä. Raakaveden syötölle ei tarvita erillistä kiertoa.
- 25

- Hinnaltaan esitetty ratkaisu ei poikkea juurikaan konventionaalisen laimennusperälaatikon hinnasta. Esitetyssä ratkaisussa käytetään puolet vähemmän kalliita laimennusventtiilejä ja -toimilaitteita.
- 30

Näin ollen entuudestaan tunnetaan sekoitinyksiköt, joissa laimennusvesi ja perälaatikon jakotukista johdettu massa sekoitetaan ja yhdistynyt virtaus johdetaan edelleen eteenpäin perälaatikossa ja muodostusviiralle. Laimennusnesteen tuontikohtia sijaitsee perälaatikon eri leveysasemissa ja näin ollen riippuvaisesti siitä tiheydestä, jolla laimennuskohtia sijaitsee perälaatikon leveydeltä, saadaan haluttu resoluutio rainan neliöpainon säätöön.

Keksinnön mukaiselle menetelmälle ja laitteistolle on tunnusomaista se, mitä on esitetty patenttivaatimuksissa.

10

Tässä hakemuksessa ehdotetaan siten käytettäväksi ainakin kaksiportaista laimennusta. Laimennuksen ensimmäisessä vaiheessa suoritetaan neliöpainoprofiilin karkeasäätö ja laimennuksen toisessa vaiheessa hienosäätö. Ensimmäisessä vaiheessa käytetään viiravettä laimennusvetenä ja ensimmäisessä vaiheessa ovat venttiilit harvemmalla jaotuksella kuin toisessa säätövaiheessa, jossa venttiilit ovat tiheämmällä jaotuksella kuin ensimmäisessä laimennusvaiheessa. Etuna ratkaisussa on se, että toisen vaiheen venttiilit voivat olla konstruktioltaan vähemmän tarkkuutta vaativia ja siten halvempia kuin ensimmäisen vaiheen venttiilit. Ne eivät tukkeudu, koska toisessa vaiheessa käytetään kuituja sisältämätöntä laimennusvettä. Venttiilit voivat siten sisältää pienemmät kanavat. Ne eivät vaadi paljon tilaa.

20

Keksinnön puitteissa voidaan käyttää myös kolmivaiheisia tai useampivaiheista säätöä, mutta edullisin säätöratkaisu on kaksivaiheinen laimennusnesteen säätö.

25 Paperikoneen tai kartonkikoneen perälaatikkorakenne voi olla edullisesti seuraava:

- a) massa johdetaan massanjakotukkiin, joka kapenee poistopäätyään kohti tavanomaisesti,
- b) massanjakotukista johdetaan massavirta pillistöön ja edelleen pillistön kautta välikammioon,

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- c) välikammioista johdetaan massavirtaus edelleen turbulenssigenaattoriin ja turbulenssigenaattorista edelleen huulikartion kautta muodostusviiralle.

5 Keksintöä selostetaan seuraavassa viittaamalla oheisien piirustuksien kuvioissa esitettyihin keksinnön eräisiin edullisiin suoritusmuotoihin, joihin keksintöä ei ole tarkoitus kuitenkaan yksinomaan rajoittaa.

10 Keksinnön mukaisesti sijaitsevat ensimmäiset laimennusvaiheen venttiilit pillistön yhteydessä ja toisen laimennusvaiheen venttiilit välikammion jälkeen turbulenssigenaattorin yhteydessä.

15 Kuvioissa 1A–1C on esitetty keksinnön mukainen menetelmä vaiheittain. Kuvion 1A kuvaaja  $F_1$  esittää korjaamatonta jakotukilta  $J_1$  johdetun massan neliöpainoprofiilia koneleveydeltä. Ensimmäisessä laimennusvaiheessa suoritetaan karkea neliöpainoprofiililisäätö ensimmäisen laimennusvaiheen venttiileillä  $V_1, V_2, \dots$

Neliöpainoprofiilia säätävien venttiilien  $V_1, V_2 \dots$  jälkeistä neliöpainoprofiilia esitetään kuvion 1B kuvaajassa  $F_1'$ .

20 Kuviossa 1C kuvaaja  $F_2$  esittää toisen laimennusvaiheen jälkeistä korjattua massan neliöpainoprofiilia. Toisen laimennusvaiheen laimennusventtiilit  $V_1', V_2' \dots$  on sijoitettu esimerkiksi turbulenssigenaattorin yhteyteen. Kuvaaja  $F_2$  esittää neliöpainoprofiilia massavirrassa koneleveydeltä toisen vaiheen venttiilien  $V_1', V_2' \dots$  suorittaman säädön jälkeen.

25 Kuvioissa 1A–1C esittää vaakakoordinaatti  $X$  perälaatikkokäyttöä ja pystykoordinaatti  $Y$  esittää neliöpainoa. Pystykoordinaatista  $Y$  on luettavissa massassa ja edelleen rai-  
nassa esiintyvä neliöpainon poikkeama 0-tasosta eli neliöpainovirhe. Neliöpainoprofiili  
30 voidaan mitata massavirrasta, mutta helpoin tapa on mitata neliöpaino valmiista paperi-  
tai kartonkirainasta.

Kuviossa 2 on esitetty keksinnön mukainen paperikoneen tai kartonkikoneen perälaatikko.

- 5 Kuviossa 1A ensimmäisessä kuvaajassa  $F_1$  on esitetty ensimmäisen laimennusvaiheen säätö. Kuvaaja  $F_1$  esittää massassa esiintyvää neliöpainovaihtelua ennen ensimmäisen vaiheen säätöventtiilejä  $V_1, V_2, V_3 \dots$

- 10 Kuviossa 1A esittää kuvaaja  $F_1$  massassa  $M_1$  esiintyvää neliöpainovaihtelua. Keskimääräinen neliöpainovaihtelu on esitetty edelleen kuvaajalla  $F_{10}$ . Niin kuin kuvaajasta  $F_{10}$  nähdään esiintyy neliöpainossa ensinnäkin muotovirhe ja toiseksi paikallinen virhe. Kyseinen muotovirhe korjataan ensimmäisen laimennusvaiheen I säätöventtiileillä  $V_1, V_2 \dots$  niin, että kuvaajasta  $F_{10}$  saadaan suora. Paikalliset virheet korjataan toisen vaiheen II neliöpainosäädöllä venttiileillä  $V_1', V_2' \dots$

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- Kuvion 1B kuvaaja  $F_1'$  esittää ensimmäisen vaiheen jälkeistä tilannetta, jolloin laimennusnesteen tuonnilla on toteutettu massan  $M_1$  neliöpainon säätö. Kuvaajassa vaakakoordinaatisto X esittää perälaatikon poikkisuuntaista asemaa ja venttiilien asemia on merkitty  $V_1', V_2', V_3' \dots$  vaakakoordinaatistoon X. Pystykoordinaatistossa Y on esitetty massan neliöpainovirhe ensimmäisen vaiheen I säädön jälkeen.

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- Kuviossa 1C on esitetty toisen laimennusvaiheen II neliöpainosäätöä. Kuvaaja  $F_2$  esittää tilannetta toisen laimennusvaiheen laimennusnesteventtiilien  $V_1', V_2', V_3' \dots$  jälkeen. Kuvaaja  $F_2$  on suora ja neliöpainovirhettä ei enää esiinny. Kuvaajassa vaakakoordinaatit kuvaavat perälaatikkoleveyttä ja venttiilien asemaa on merkitty  $V_1', V_2' \dots$  kulloiseenkin vaakakoordinaatiston X pisteeseen. Pystykoordinaatti Y esittää massan neliöpainovirhettä. 0-taso esittää virheetöntä vakioneliöpainotilannetta. Ensimmäisen vaiheen I laimennusvetenä käytetään viiravettä, joka voi sisältää kuituja ja täyte-/hienoaineita. Toisen vaiheen II laimennus suoritetaan laimennusvedellä, jossa ei ole kuituja, kuten raakavedellä. Etuna tällöin on, että voidaan käyttää tavanomaisia venttiilejä  $V_1', V_2', V_3' \dots$ , koska kuitujen aiheuttamaa kanavien tukkeutumisriskiä ei ole.

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Mainitunlaiset laimennusvesisyötöt voidaan sijoittaa pienemmällä jaotuksella kuin nykyisin laimennussäädössä olevan 60 mm sijaan voidaan mennä 30 mm säätöön venttiilien välillä. Käytettävä laimennusvesimäärä on vähäinen ja erillistä laimennusveden kiertoa ei tarvita. Näin ollen keksinnön mukainen ratkaisu on konstruktioltaan edullinen ja sillä päästään tiheämpään venttiilien väliseen jaotukseen eli suurempaan resoluutioon eli säädön tarkkuuteen. Käyttämällä raakavettä toisen vaiheen säädössä voidaan käyttää tavanomaisia venttiiliratkaisuja, jolloin myös venttiilit voidaan sijoittaa jopa 20–30 mm jaotuksella toisiinsa nähden. Sen sijaan ensimmäisen vaiheen säädössä voidaan säätöresoluutiota mainitun vaiheen kohdalla muuttaa niin, että venttiilit, esim. 60 mm:n tavanomaisen 1-vaihelaimennuksen sijaan ovat esimerkiksi 120 mm:n jaotuksella toisiinsa nähden. Näin ollen käyttämällä keksinnön mukaista ratkaisua, jossa ensimmäisen vaiheen laimennuksessa laimennusvetenä käytetään viiravettä ja toisen vaiheen laimennuksessa kuituja sisältämätöntä laimennusvettä, päästään kokonaislopputulokseen, jossa säätötarkkuus on parempi kuin tavanomaisessa yksivaiheisessa laimennuksessa ja jossa kuitenkin konstruktio- ja rakenteen osalta eivät ole suurentuneet yksivaiheiseen laimennukseen verrattuna.

Laimennuksen ensimmäisessä vaiheessa suoritetaan neliöpainoprofiilin karkeasäätö ja laimennuksen toisessa vaiheessa hienosäätö. Toisessa laimennusvaiheessa käytettävä laimennusvesi on edullisesti raakavettä tai kirkastettua viiravettä. Näin ollen toisen vaiheen laimennusvesi sisältää kiintoaineita ja/tai kuituja olennaisesti prosentuaalisesti vähemmän kuin ensimmäisen vaiheen laimennusvesi, joka edullisesti on viiralta otettua vettä. Edullisimmin toisen vaiheen laimennusvesi on kiinto- ja täyteaineita sekä kuituja sisältämätöntä raakavettä.

Kuviossa 2 on esitetty keksinnön mukainen paperikoneen tai kartonkikoneen perälaatikko 10. Perälaatikko käsittää massanjakotukin  $J_1$ , massanjakotukin jälkeen pillistön 11, pillistön jälkeen välikammion 12 ja välikammion jälkeen turbulenssigeneraattorin 13 ja edelleen huulikartion 14, josta massa  $M_1$  johdetaan muodostusviiralle  $H_1$ . Keksinnön mukaisesti suoritetaan ensimmäisen vaiheen laimennus pillistön 11 putkiin  $11a_{1,1}$ ,

11a<sub>1.2</sub>, 11a<sub>4.1</sub>, 11a<sub>4.2</sub> ... venttiilien V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub> ... kautta viiraveden jakotukista J<sub>2</sub> johdetaan viiravesi (nuoli L<sub>1</sub>) putkiin D<sub>1</sub>, D<sub>2</sub>, D<sub>3</sub> ... ja niiden kautta venttiileille V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub> ... ja edelleen kyseisten säädettävien venttiilien V<sub>1</sub>, V<sub>2</sub> ... kautta pillistöön 11 sen putkiin 11a<sub>1.1</sub>, 11a<sub>1.2</sub>, 11a<sub>4.1</sub>, 11a<sub>4.2</sub> ... Venttiilit V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub> ... sijaitsevat esimerkiksi 120 mm jao-  
5 tuksella 10 m leveän perälaatikon yhteydessä. Toinen laimennuskohta eli toisen laimennusvaiheen II venttiilit V<sub>1</sub>', V<sub>2</sub>' ... sijaitsevat edullisesti turbulenssigeneraattorin 13 turbulenssiputkien 13a<sub>1.1</sub>, 13a<sub>1.2</sub>, 13a<sub>1.3</sub>, 13a<sub>2.1</sub>, 13a<sub>2.2</sub>, 13a<sub>2.3</sub> yhteydessä perälaatikon eri leveyspisteissä. Raakavesi johdetaan (nuoli L<sub>2</sub>) raakaveden jakotukista J<sub>3</sub> kanavaan D<sub>1</sub>', D<sub>2</sub>', D<sub>3</sub>' ... ja venttiilien V<sub>1</sub>', V<sub>2</sub>' ... kautta edelleen turbulenssigeneraattorien 13 putkiin  
10 13a<sub>1.1</sub>, 13a<sub>1.2</sub>, 13a<sub>1.3</sub>, 13a<sub>2.1</sub>, 13a<sub>2.2</sub>, 13a<sub>2.3</sub>, jossa raakavesi johdetaan ensimmäisessä vaiheessa laimennetun massan yhteyteen. Massan M<sub>1</sub> virtaus on esitetty nuolin S<sub>1</sub> ja laimennusvesien virtausta on esitetty nuolin L<sub>1</sub> ja L<sub>2</sub>.

15 Tuotaessa laimennusneste massavirtauksen yhteyteen ensimmäisessä laimennusvaiheessa ja toisessa laimennusvaiheessa laimennusvesi johdetaan ensimmäisessä laimennusvaiheessa I joko yhteen tai useampaan, edullisesti kaikkiin, pillistön 11 kyseisen leveyskohdan putkirivien putkiin. Vastaavasti toisessa laimennusvaiheessa II voidaan laimennusvesi johtaa joko yhteen kyseisen leveyskohdan turbulenssigeneraattorin 13 putkeen tai kyseisen leveyskohdan useampaan putkeen, edullisesti kaikkiin putkiin.



## Patenttivaatimukset

1. Menetelmä laimennusveden johtamiseksi paperikoneen tai kartonkikoneen perälaatikon massanjakotukista johdetun massavirtauksen yhteyteen, **tunnettu** siitä, että menetelmässä suoritetaan laimennus ainakin kaksivaiheisesti käyttämällä ensimmäisessä laimennusvaiheessa (I) suuremmalla keskinäisellä välimatkalla perälaatikon eri leveyskohdissa olevia venttiilejä ( $V_1, V_2, V_3 \dots$ ) ja johtamalla laimennusvesi mainittujen venttiilien kautta halutuille perälaatikon leveyskohdille paperin tai kartongin neliöpainon säätötarpeen mukaisesti ja että menetelmässä toisessa laimennusvaiheessa (II) johdetaan ensimmäisestä laimennusvaiheesta (I) tulevan massavirtauksen yhteyteen laimennusvettä, jota säädetään venttiileillä ( $V_1', V_2' \dots$ ), jotka venttiilit ( $V_1', V_2' \dots$ ) on asetettu tiheämmälle jaotukselle kuin ensimmäisen laimennusvaiheen (I) venttiilit ( $V_1, V_2, V_3 \dots$ ).
2. Patenttivaatimuksen 1 mukainen menetelmä, **tunnettu** siitä, että laimennuksen ensimmäisessä vaiheessa (I) suoritetaan massan ( $M_1$ ) neliöpainoprofiilin karkeasäätö ja laimennuksen toisessa vaiheessa (II) massan ( $M_1$ ) neliöpainoprofiilin hienosäätö koneleveydeltä.
3. Patenttivaatimuksen 1 tai 2 mukainen menetelmä, **tunnettu** siitä, että laimennuksen toisessa vaiheessa (II) käytetään laimennusvetenä vettä, jonka kiintoaine, täyteaine tai kuitupitoisuus on olennaisesti prosentuaalisesti pienempi kuin ensimmäisen laimennusvaiheen (I) laimennusveden.
4. Jonkin edellä olevan patenttivaatimuksen 1–3 mukainen menetelmä, **tunnettu** siitä, että toisessa laimennusvaiheessa (II) käytettävä laimennusvesi on raakavettä tai kirkastettua viiravettä.
5. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, **tunnettu** siitä, että ensimmäisen vaiheen (I) laimennusvesi on viiravettä.

6. Paperikoneen tai kartonkikoneen perälaatikko (10), joka käsittää massanjakotukin ( $J_1$ ) ja sen jälkeen pillistön (11) ja pillistön jälkeen välikammion (12) ja välikammion jälkeen turbulenssigeneraattorin (13) ja turbulenssigeneraattorin jälkeen huulikartion (14), josta massa johdetaan edelleen muodostusviiralle ( $H_1$ ), **tunnettu** siitä, että laitteisto käsittää ensimmäisen laimennusvaiheen (I) venttiilit ( $V_1, V_2, V_3, \dots$ ), joiden kautta johdetaan laimennusvettä jakotukista ( $J_1$ ) johdetun massan ( $M_1$ ) yhteyteen halutuille kohdille perälaatikkoleveyttä rainan neliöpainon säätämiseksi ensimmäisessä vaiheessa (I) ja että perälaatikko käsittää toisen laimennusvaiheen (II) venttiilit ( $V_1', V_2', V_3', \dots$ ), joiden venttiilien ( $V_1', V_2', \dots$ ) kautta johdetaan toisen laimennusvaiheen laimennusvesi ensimmäisestä laimennusvaiheesta (I) tulleen massan ( $M_1$ ) yhteyteen.
7. Patenttivaatimuksen 6 mukainen paperikoneen tai kartonkikoneen perälaatikko, **tunnettu** siitä, että ensimmäisen laimennusvaiheen (I) laimennusvesi johdetaan massanjakotukista ( $J_1$ ) johdetun massan ( $M_1$ ) yhteyteen perälaatikon pillistön (11) yhteydessä ja että toisen laimennusvaiheen (II) laimennusvesi johdetaan ensimmäisestä laimennusvaiheesta (I) tulleen massan ( $M_1$ ) yhteyteen turbulenssigeneraattorin (13) yhteydessä.
8. Patenttivaatimuksen 6 tai 7 mukainen perälaatikko, **tunnettu** siitä, että ensimmäisen laimennusvaiheen (I) venttiilit ( $V_1, V_2, V_3, \dots$ ) ovat suuremman keskinäisen välimatkan päässä toisistaan kuin toisen laimennusvaiheen (II) venttiilit ( $V_1', V_2, V_3', \dots$ ), jolloin ensimmäisen laimennusvaiheen (I) venttiileillä ( $V_1, V_2, \dots$ ) suoritetaan rainan neliöpainon karkeasäätö ja toisen laimennusvaiheen (II) venttiileillä ( $V_1', V_2', \dots$ ) suoritetaan rainan neliöpainon hienosäätö.
9. Jonkin edellä olevan patenttivaatimuksen 6–8 mukainen perälaatikko, **tunnettu** siitä, että laitteisto käsittää toisen laimennusvaiheen (II) laimennusvedelle jakotukin ( $J_3$ ), joka käsittää laimennusvetenä raakavettä.

### Tiivistelmä

Keksinnön kohteena on menetelmä ja laitteisto laimennusnesteen sekoittamiseksi massavirtaukseen paperikoneessa tai kartonkikoneessa. Menetelmässä suoritetaan laimennus ainakin kaksivaiheisesti käyttämällä ensimmäisessä laimennusvaiheessa (I) suuremmalla keskinäisellä välimatkalla perälaatikon eri leveyskohdissa olevia venttiilejä ( $V_1, V_2, V_3, \dots$ ) ja johtamalla laimennusvesi mainittujen venttiilien kautta halutuille perälaatikon leveyskohdille paperin tai kartongin neliöpainon säätötarpeen mukaisesti. Menetelmässä toisessa laimennusvaiheessa (II) johdetaan ensimmäisestä laimennusvaiheesta (I) tulevan massavirtauksen yhteyteen laimennusvettä, jota säädetään venttiileillä ( $V_1', V_2', \dots$ ), jotka venttiilit ( $V_1', V_2', \dots$ ) on asetettu tiheämmälle jaotukselle kuin ensimmäisen laimennusvaiheen (I) venttiilit ( $V_1, V_2, V_3, \dots$ ).

(Fig. 2)

## PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

To:

FORSSÉN & SALOMAA OY  
Yrjönkatu 30  
FIN-00100 Helsinki  
FINLANDE

|  |  |
|--|--|
| Date of mailing (day/month/year)<br>28 March 2001 (28.03.01) | <b>IMPORTANT NOTIFICATION</b>  |
| Applicant's or agent's file reference<br>MH/FI990967         |  |
| International application No.<br>PCT/FI00/00320              | International filing date (day/month/year)<br>14 April 2000 (14.04.00) |

## 1. The following indications appeared on record concerning:

☒ the applicant      ☐ the inventor      ☐ the agent      ☐ the common representative

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## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person      ☒ the name      ☐ the address      ☐ the nationality      ☐ the residence

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## Teleprinter No.

## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

|   |   |
|---|---|
| <input checked="" type="checkbox"/> the receiving Office                              | <input type="checkbox"/> the designated Offices concerned         |
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The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

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Authorized officer

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## PATENT COOPERATION TREATY

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## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

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Arlington, VA 22202  
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| Date of mailing (day/month/year)<br>21 November 2000 (21.11.00)        |  |
| International application No.<br>PCT/FI00/00320                        | Applicant's or agent's file reference<br>MH/FI990967       |
| International filing date (day/month/year)<br>14 April 2000 (14.04.00) | Priority date (day/month/year)<br>28 April 1999 (28.04.99) |
| Applicant<br>LUMIALA, Juhana   |  |

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
04 October 2000 (04.10.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

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